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Evidence for two-dimensional nucleation of superconductivity in MgB2

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Abstract

According to the crystal structure of MgB2 and band structure calculations quasi-tw--dimensional (2D) boron planes are responsible for the superconductivity. We report on critical fields and resistance measurements of 30 nm thick MgB2 films grown on MgO single crystalline substrate. A linear temperature dependence of the parallel and perpendicular upper critical fields indicates a 3D-like penetration of magnetic field into the sample. Resistivity measurements, in contrast, yield a temperature dependence of fluctuation conductivity above Tc which agrees with the Aslamazov-Larkin theory of fluctuations in 2D superconductors. We consider this finding as an experimental evidence of two-dimensional nucleation of superconductivity in MgB2.

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